Tijdschrift voor Economie en Management
Vol. XXXVII, 2, 1992

Do Belgian Banks Have Power Vis-a-Vis the Minister of Finance?

by H. DEGRYSE*

I. INTRODUCTION

A feature of the Belgian economy is the regular concertation between government and the financial sector. In a mixed economy, the government takes on a variety of roles with respect to the financial sector (Bruni et al. (1982)). In this paper, we want to focus on one aspect of this many-sided relationship namely the financing conditions of government debt. More specific, we focus on the interest rate determination of one financial instrument issued by the government namely the treasury bill.

Typically, in OECD countries, the treasury bill rate is lower than the interbank rate. The Belgian situation showed the opposite before the money market reform of january 29th 1991. The Belgian treasury bill rate exceeded the interbank rate. Research concerning this phenomenon has not been satisfactory up to now. Hence, there existed a need for further elaborating the relation between the interbank rate and the treasury bill rate. This paper proposes an application of a generalised asymmetric Nash bargaining model (Kalai (1977)) to the treasury bill rate determination process. In the economic literature, a lot of work has been done concerning bargaining problems between

* Centrum voor Economische Studiën, K.U.Leuven.
The author gratefully acknowledges comments made by Prof. Dr. P. Van Cayseele, Prof. Dr. D. Heremans, Dr. M. De Broeck, L. Bettendorf, J. Bouckaert and H. Lanoye.

union and management (Svejnar (1986), Veugelers (1989), Spinnewyn and Svejnar (1991)) and between consumers and pharmaceutical innovators (Van Cayseele (1987)).

The paper is organised as follows. Section II provides some evidence on government' financing conditions by looking at covered interest rate parity and by analysing the relation between government debt and interest rates. The bargaining framework together with the empirical results are introduced in section III. Section IV characterises the recent Belgian money market changes. Section V presents some conclusions. In the appendix the data sources and description are given.

II. THE FINANCING CONDITIONS IN THE LITERATURE

A. *Covered interest rate parity*

Traditionally, the theory of interest rate parity is more or less accepted for the Eurocurrency markets (Fratianni and Wakeman (1982)). The covered interest rate parity theorem can be written as follows (Grabbe (1986)):

$$1 + i_t = \left[\frac{F}{S}_t\right] (1 + i^F_t)$$

where i = the interest rate on the domestic currency unit
i^F = the interest rate on the foreign currency unit
S = the spot exchange rate, expressed as the number of units of the domestic currency per unit of foreign currency
F = the forward exchange rate
t = time index

To test whether this condition holds between the Euro-Belgian franc (Euro-BF) and the Euro-Deutsche mark (Euro-DM) on the one hand and between the Belgian treasury bill rate and the Euro-DM rate on the other hand, we test the following relationships:

$$1 + EBF_t = \alpha\left[\frac{F}{S}_t\right] (1 + EMR_t) + u_t \qquad (1)$$

$$1 + r_{t\ b_t} = \beta\left[\frac{F}{S}_t\right] (1 + EMR_t) + v_t \qquad (2)$$

where EBF = the Euro-BF mean[1] rate on three-months deposits
EMR = the Euro-DM mean rate on three-months deposits

TABLE 1

Interest rate parity estimations (1985:5-1990:6)

	eq (1)		eq (2)	
	coeff.	stand.error	coeff.	stand.error
EMR	0.99996	8.61 E-05	1.000201	9.13 E-05
R^2	0.956		0.950	
s.e.r.	0.068%		0.072%	
D.W.	2.226		2.176	

Source: Own calculations

r = the three-months Belgian treasury bill rate
S = the spot exchange rate expressed as the number of BF per unit of DM
F = the three-months forward exchange rate[2]
u, v = error terms

The estimations are performed with end-of-month data[3] for the period 1985:5-1990:6[4]. Ordinary least squares is used as estimation method. The results are presented in Table 1.

The null hypothesis of no autocorrelation of the disturbance terms has not to be rejected at a significance level of 5% as can be seen from the Durbin Watson (D.W.) statistic[5]. The overall performance of both regressions is well. As determination coefficient, an expression valid for regressions without constant term is calculated[6] (Barten (1987)). One clearly cannot reject the perfect integration of the Euro-BF and Euro-DM market since the coefficient of EMR is statistically insigni- ficant different from one. The null hypothesis of perfect substitutability between the three-months Belgian treasury bill market and the three-months Euro-DM market has to be rejected at a significance level of 5%. Hence, the treasury bill and Euro-DM may be analysed within the frame of segmented markets.

Naudts and Schokkaert (1988) considered this imperfect substitutability due to asset related risk. Institutional factors such as regulations to force financial institutions to hold a minimum fraction of their portfolio in the form of treasury bills are also relevant for causing imperfect substitutability. Bargaining power could be incorporated in these institutional factors and hence cause segmented markets. Some additional evidence is presented in Table 2 where the treasury bill and interbank rate are compared for some OECD countries.

TABLE 2

Comparison between the treasury bill rate (r) and the interbank rate (ib) (the mean for 1985 - 1989, 3-months rate)

	r	ib	ib - $r_{t\ b}$
U.S.	6.81	7.65	0.84
U.K.	10.81	11.38	0.57
Germ(1)	4.42	5.06	0.64
Italy	11.91	12.83	0.92
Ireland	10.11	10.44	0.33
Belgium	7.87	7.70	-0.17

(1) ib = 3-months $r_{t\ b}$ = 12-months

Source: International Financial Statistics
O.E.C.D. Financial Statistics
Central Bank of Ireland Quarterly Bulletin
CESMOM database

Typically, the treasury bill rate is lower than the interbank rate also for high debt/GNP countries. One has to be careful with the evidence for Italy since some fiscal measures were taken to improve the attractiveness of holding Italian treasury bills. Belgium is the only country where the treasury bill rate exceeds the interbank rate. During the period 1985 - 1989, the interbank rate was seventeen basis points lower than the treasury bill rate. Below, we argue that the Belgian evidence results from bargaining power of the financial sector with respect to the treasury bill rate determination.

B. *Government debt and interest rates*

Until recently, government liabilities were considered to be risk free assets par excellence. The treasury bill rate was considered as the benchmark yield in the money market whereas the government bond yield played the same role in the capital market. A lot of countries have experienced during the last two decades growing budget deficits and accumulated a high stock of government debt. In this context, some explanations are given about the link between the size of the government debt and the interest rates. There exist two strands of literature. Both strands assume the government will fully honor its debt obligations in the future. The first view is the Ricardian Equivalence Hypothesis (Barro (1974)), which states that individuals have perfect foresight and hence foresee that government borrowing will generate additional taxes in the future. Then rational and altruistic consumers

reduce their consumption by an amount which enables them to pay the future taxes. Or government borrowing is seen as a perfect substitute for saving such that the level of the interest rates remains unaffected. A second strand of literature claims there is an effect from government debt on the level of the interest rates. Increases in government bonds lead to an increase in private sector wealth and hence in current aggregate consumption and aggregate demand. Private savings goes up by less than the increase in government debt. Real interest rates rise and some crowding out of private investment occurs (Plosser (1982)). However, all those channels generate effects on the general level of interest rates. The financing conditions of the government vis-à-vis the private sector remain unaltered.

Recently the question was raised whether there exists an issuer specific premium also for assets issued by the government (De Broeck (1990), Annaert (1991)). This approach drops the assumption of fully honoring the debt obligations in the future. An issuer-specific premium would be incorporated in the interest rate on government debt since financial markets perceived that holding government liabilities is no longer as safe as before. Governments may have an incentive to tax or inflate away their debt obligations in the future. Hence, investors require a premium to hold government debt. The evidence on those issuer-specific premia points to low premia (De Broeck (1990)). Therefore, additional research to explain the superiority of the treasury bill rate with respect to the interbank rate (Lefebvre (1990)) would be welcome. Here, a first step in this direction is taken.

III. THE MODEL

Until january 29th 1991, the treasury bill rate was 'de jure' determined by the Central Bank of Belgium in communication with the Belgian Minister of Finance. Treasury bills were tendered on tap. The market was reserved solely for Belgian and Luxemburg financial institutions[7]. The treasury bill rate served a dual purpose. On the one hand, the government used the treasury bill rate as an instrument of monetary policy. On the other hand, treasury bills were used to finance a large part of government debt. By this dual purpose, banks and government are engaged in a bargaining situation to determine the treasury bill rate.

A. *Bargaining model*

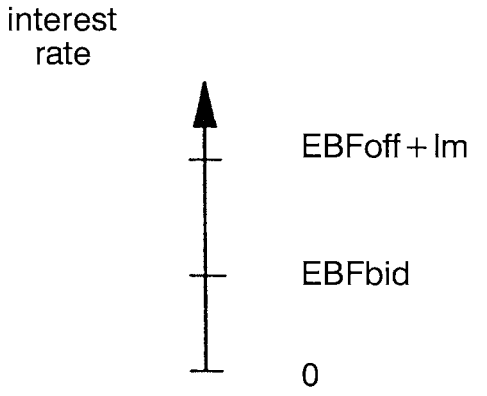
Banks (B) and Government (G) are engaged in a bargaining situation to determine the interest rate on treasury bills (r). The threat point of both B and G have to be stipulated in order to characterize a solution.

Banks can threaten the government to stop the financing of the short term debt and switch their available funds to the closest substitute. The interbank market or Euro-BF market can be seen as the closest available one since they have a comparable maturity and currency denomination[8]. On those markets, the banks can only achieve the bid rate since they want to deposit their available funds. Whenever the treasury bill rate is lower than the Euro-BF bid rate (EBF), the banks switch their funds to the Euro-BF market. In the long run, however, banks could change their portfolio behavior and tap new markets e.g. markets for government financing of other countries or extend the financing to private companies. In this paper, we take the EBF rate as the banks' threat point.

The government's threat point is to stop the printing of treasury bills and borrow on the international money market. Assuming she takes up Belgian francs, she has to pay the Euro-BF offered rate (EBF) plus a lending margin (lm) charged by the consortium of Euromarket banks. The government has to pay an additional premium

FIGURE 1

The threat points of the bargaining parties



above the interbank offered rate since she is not allowed to operate directly on the international money market. Whenever r exceeds EBF plus the charged lending margin, the government exercises her threat and borrows on the international money market. In the long run, however, she could change her behavior by issuing more long term bonds. In Belgium this was not a solution since, until recently, the issues of government bonds were underwritten by a syndicate of financial institutions that guaranteed the placement of the bonds with the public. For the empirical analysis, we take EBF + lm as threat point. In Figure 1 the threat points are shown on an interest rate line.

It is reasonable to assume that gaps between government expenditures and receipts are the primary determinant of the amount of treasury bills issued. We assume the supply of treasury bills not to be sensitive with respect to the interest rate within the interval [EBF_{bid}, EBF_{off} + lm] (Cook and Lawler (1984)). Hence we assume that the size of the government deficit and the division between short and long term debt remains unaltered whenever the threat point is exercised.

Under the constraints generated by both threat points each party maximizes its utility. Suppose the government has the following utility function :

$$V_g(Q,r_{t\,b}) = -Q\,\frac{(r_{t\,b})^{\gamma}}{\gamma}$$

where Q is the amount of short term debt to be financed
$r_{t\,b}$ is the three-months treasury bill rate
γ is a parameter reflecting attitude towards risk

The banks' utility function is specified as follows :

$$V_b(Q,r_{t\,b}) = Q\,\frac{(r_{t\,b})^{\upsilon}}{\upsilon}$$

where Q is the amount of short term debt to be financed
$r_{t\,b}$ is the three-months treasury bill rate
υ is a parameter reflecting attitude towards risk

The coefficient of relative risk aversion, R, is given by the following formula :

$$R = \frac{-V''(.)r_{t\,b}}{V'(.)} \qquad \text{(Pratt (1964))}$$

and equals 1-γ for the government and 1-υ for the banks. If $R>0$ the parties are risk averse. On the contrary, if $R<0$ they are risk loving[9]. Risk neutrality appears if $R=0$ or $\gamma=\upsilon=1$.

Since the threat point of G equals EBF_{off} + lm, we generate the following 0-normalised utility function:

$$U_g(Q,r_{t\,b}) = V_g(Q,r_{t\,b}) - V_g(Q,EBF_{off} + lm) \text{ or}$$

$$U_g(Q,r_{t\,b}) = Q\left[\frac{(EBF_{off} + lm)^{\gamma} - (r_{t\,b})^{\gamma}}{\gamma}\right]$$

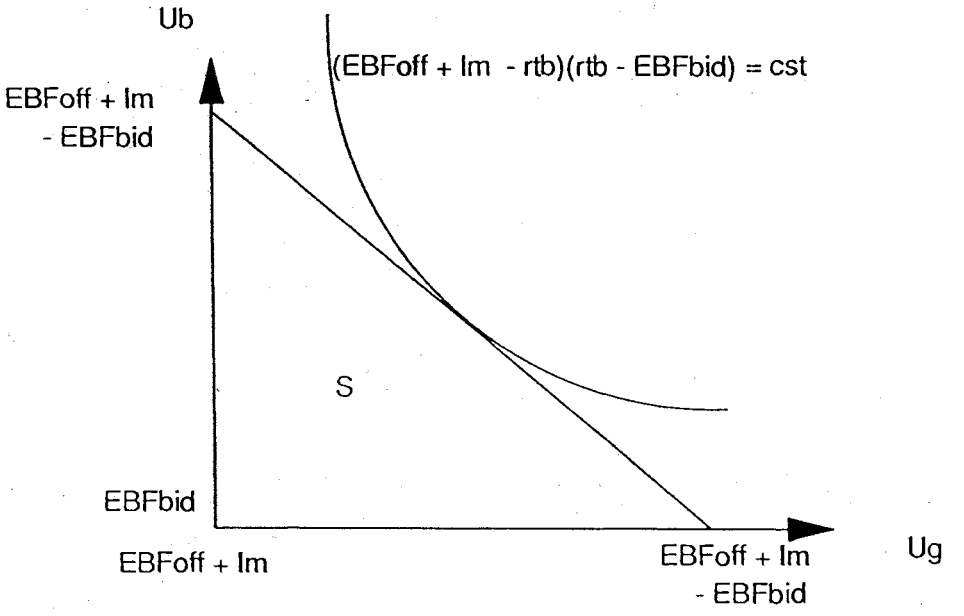
Introducing the threat point within the banks' utility function generates the following expression:

$$U_b(Q,r_{t\,b}) = Q\left[\frac{r_{t\,b}^{\upsilon} - EBF_{bid}^{\upsilon}}{\upsilon}\right]$$

Already in 1950, Nash presented an axiomatic model to achieve a unique bargaining outcome by presupposing four axioms (Osborne and Rubinstein (1991)). The axioms are Invariance to Equivalent Utility

FIGURE 2

The Nash solution for $\gamma=\upsilon=1$



Representations, Symmetry, Independence of Irrelevant Alternatives and Pareto-Efficiency[10].

As Nash showed, the unique outcome is generated by maximizing the following expression:

$$\max_{r_{t\,b},Q} [U_g(Q,r_{t\,b})]\,[U_b(Q,r_{t\,b})]$$

$$\text{s.t. } lm + EBF_{off} \geqslant r_{t\,b}$$
$$r_{t\,b} \geqslant EBF_{bid}$$

The solution maximizes the product of the players' gains. This is the utility they get in the solution minus the utility received when carrying out their threat. The Nash solution for $\gamma = \upsilon = 1$ and a given $\overline{Q}$ can be represented as in Figure 2.

On the horizontal and vertical axis respectively, the utility of government and banks are shown. The origin represents the disagreement point. The set S is the feasible set. If one of both players exercises his threat, the product of the utilities becomes zero. The Nash solution is reached where the highest indifference curve is tangent to S. This is where $r_{t\,b} = (EBF_{bid} + EBF_{off} + lm)/2$. The parties divide the surplus into two equal pieces.

In 1977 Kalai presented an article where he proposed a maximand to reach a general asymmetric Nash bargaining solution. This maximand implies both players to act as if they maximize the weighted average of their utilities, the weights being their respective bargaining power coefficients. Applying this theory we become the following adjusted maximand:

$$\max V = [U_g(Q,r_{t\,b})]^{(1-\delta)}[U_b(Q,r_{t\,b})]^{\delta}$$

If δ equals zero, the government has all bargaining power. The reverse holds if δ equals one.
The first-order condition (F.O.C.) then is:

$$\frac{\partial V}{\partial r_{t\,b}} = 0 = Q[-(1-\delta)\frac{V}{U_g} r_{t\,b}^{\gamma-1} + \delta\frac{V}{U_b} r_{t\,b}^{\upsilon-1}] \Leftrightarrow$$

$$\frac{\delta}{1-\delta} = r_{t\,b}^{\gamma-\upsilon}\frac{U_b}{U_g} \qquad (3)$$

The left hand side of (3) equals the ratio of bargaining powers. The

right hand side equals the ratio of the utilities times the treasury bill rate to the exponent of the difference in relative risk 'behavior'. If $\upsilon = \gamma$ then the ratio of bargaining powers equals the ratio of utilities. Assuming risk neutrality for both bargaining parties ($\gamma = \upsilon = 1$) reduces the F.O.C. to

$$\frac{\delta}{1-\delta} = \frac{r_{t\ b} - EBF_{bid}}{EBF_{off} - r_{t\ b}} \Leftrightarrow$$

$$r_{t\ b} = \delta(EBF_{off} + lm) + (1-\delta)\ EBF_{bid}$$

Since $EBF_{off} = EBF_{bid}$ + bid/ask spread, the above expression can be rewritten as

$$r_{t\ b} = EBF_{bid} + \delta \text{ spread} \qquad (4)$$

where spread equals the lending margin (lm) plus the bid/ask spread.

Equation (4) gives us an expression with δ the bargaining power of the banks. If δ equals one, the banks can extract the whole surplus. On the contrary, if δ equals zero, the government pays the EBF rate

FIGURE 3

The treasury bill rate determination game

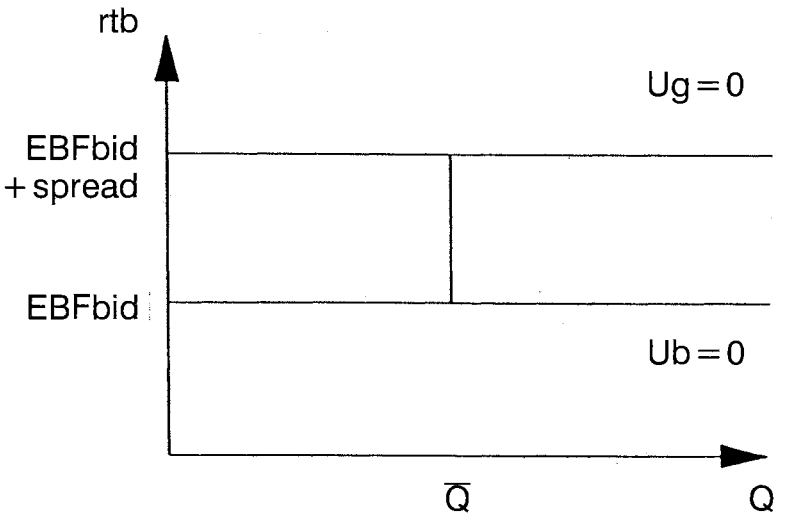


TABLE 3

Estimation results for equation (4) (1985:5-1990:6)

	free		constrained	
	coeff.	stand.error	coeff.	stand.error
EBF_{bid}[11]	1.00795	(0.01532)	1	
spread[12]	0.18021	(0.22583)	0.2967	(0.0249)
R^2	0.993		0.993	
s.e.r.	1.33%		1.32%	
D.W.	1.754		1.736	

Source: Own calculations

and receives the entire cake. This is shown in Figure 3 where $\overline{Q}$ denotes the exogenous given amount of treasury bills the government prints.

Equation (4) was estimated for the period 1985:5-1990:6. Only annual data for the lending margin are available. We assumed the lending margin to be constant during the year. First a free regression was run in order to test if the coefficient of EBF equals one. A second regression was run with the coefficient of EBF fixed at one. The results are shown in Table III.

Notice that the estimated bargaining power is very sensitive to the fixation of the EBF coefficient at one. However, fixing this coefficient at one, as derived by the F.O.C., considerably improves the estimate of the bargaining power. Again the coefficient of determination was computed for a regression without constant. The null hypothesis of no autocorrelation can not be rejected at a significance level of 5%. We can not reject the null hypothesis of the coefficient of EBF equal to one. The bargaining power of the banks (government) equals approximately 30 (70) percent. It is obvious that we have to reject the symmetric Nash-bargaining solution.

Equation (4) is of course not the end of the story. As argued supra their exists an issuer-specific premium as well for banks as for government. The difference in issuer-specific premia between those bargaining parties has to be integrated into the model. Hence, the estimate of bargaining power will be biased in equation (4) since bargaining power and difference in default premia clutter up. In order to achieve an unbiased estimate of bargaining power, we have to correct for the possible difference in default premia between Euro-banks and the Belgian government. This is the concern of the next section.

B. *Default premia*

The objective of this section is to generate the difference in issuer-specific premia between the Euro-banks and the Belgian Treasury. Euro-banks dealing in Irish pound or Belgian franc have the same issuer-specific premium. Since the Republic of Ireland has a comparable debt/GNP ratio, it can be argued that the Belgian and Irish government have the same issuer-specific premium. The Irish treasury bill rate (Exchequer bill rate) can be assumed to be free of bargaining power due to the competitive way of interest rate determination on Exchequer bills. Exchequer bills are weekly issued by the Central Bank on behalf of the Ministry of Finance. They are issued by auction in which individuals (residents and non-residents) 15 and the non-bank institutions (home and foreign institutional investors) may also bid, through a bank or stockbroker. Due to this alternative way of rate determination, we can assume that the Irish exchequer bill rate does not incorporate bargaining power.

Fama (1986) defines the difference in default premia between two market securities as the difference between two market returns for the same combination of buy and sell maturities. Fama concludes that default premia decline with maturity. For the present purposes, this is no problem since we concentrate on three-months treasury bills and three-months Euro-market deposits. He also concluded the default premium to be related with the business cycle. According to the encompassed period, i.e. 1985:5-1990:6, we computed the average of all default premia and took this as a proxy for the difference in default premia between the Irish government and the Euro-banks. Using Fama's definition, the difference in default premia between the Euro-banks and the Irish government equals:

$$EIR - r_{t\ bir}$$

with EIR the three-months Dublin interbank mean rate on Irish pound

$r_{t\ bir}$ the three-months Exchequer bill rate.

We take this difference in issuer-specific premia as representative for the difference in issuer-specific premia between the Euro-banks and the Belgian government since we assume the Irish government has the same issuer-specific premium as the Belgian government. The

difference in default premia between the Belgian government and the Euro-banks (rp) equals then

$$rp = EIR - r_{t\ bir} \tag{5}$$

This difference in default premia has to be integrated within the bargaining model.

C. *Bargaining model incorporating default premia*

Integrating the default premium of equation (5) into the Nash-Zeuthen-Harsanyi frame generates the following adjusted maximand :

$$\max V = [U_g(Q,r_{t\ b})]^{(1-\delta)}[U_b(Q,r_{t\ b})]^{\delta}$$

$$\text{with } U_g = Q[\frac{(EBF_{bid} + spread)^{\gamma} - (r_{t\ b})^{\gamma}}{\gamma}]$$

$$U_b = Q[\frac{r_{t\ b}^{\upsilon} - (EBF_{bid} - rp)^{\upsilon}}{\upsilon}]$$

The F.O.C., conditional on risk neutrality ($\upsilon = \gamma = 1$), is

$$\frac{\partial V}{\partial r_{t\ b}} = 0 = Q[- (1 - \delta)\frac{V}{U_g} + \delta\frac{V}{U_b}] \Leftrightarrow$$

$$r_{t\ b} = EBF_{bid} + \delta\ spread - (1 - \delta)\ rp \tag{6}$$

If δ equals one, the treasury bill rate equals the EBF_{bid} rate plus the spread. On the contrary if δ equals zero, the government pays the EBF rate minus the difference in default premia rp.

TABLE 4

Estimation results for equation (6) (1985:5-1990:6)

	free		constrained	
	coeff.	stand.error	coeff.	stand.error
EBF_{bid}	0.98996	(0.01731)	1	
spread	0.65832	(0.15777)	0.5673	(0.01637)
rp	0.34168		0.4327	
R^2	0.993		0.993	
s.e.r.	1.411%		1.403%	
D.W.	1.554		1.552	

Source: Own calculations

The results of estimating equation (6) with ordinary least squares are presented in Table 4. The null hypothesis of no autocorrelation can neither be accepted nor rejected at a significance level of 5%. An R^2 valid for regressions without constant term was computed. Again a free regression was run in order to test if the coefficient of EBF_{bid} equals one. The estimate of the bargaining power is significantly different from zero. The regression points to a bargaining power of 57 percent for the banks and 43 percent for the government. Symmetry has to be rejected in favor of the asymmetric case (1% critical t-value). The results show a smaller bargaining power for government than for the banks. The integration of the difference in default premia between the Euro-banks and the government causes an upswing in banks estimated bargaining power. This upswing is due to the fact that banks extract the entire difference in default premia in addition to their previous estimated bargaining power. The reverse analysis can be made for the government. The bargaining power of the banks is reflected in the interest rate paid by the government. Banks' bargaining power consists of two components. Firstly, banks extract the entire difference in default premia between the bargaining parties. Secondly, the government pays a higher interest rate than the interbank rate.

IV. BELGIAN MONEY MARKET REFORM

Since january 29th 1991 an auction procedure is used to determine the treasury bill rate. Non-financial institutions as well as financial institutions, non-residents as well as residents can pass through their bids to buy treasury bills. All bids are centralised within the Central Bank. Allocations take place at the most favorable bid 18 prices, up to the point at which the desired amount is purchased or placed. If accepted, each bidder receives the rate indicated in the bid he submitted ("U.S. allocation system")[16].

An argument often used to motivate the recent changes of the treasury bill rate determination process is the level of the short term debt and hence the inherent saving on expenses. However, already in 1986 there was a huge amount of treasury bills. With this argument in mind, why did the government not invent the reform before ?

Before january 29th 1991, the treasury bill market was used by banks to optimize their liquidity positions. Hence, every change in the treasury bill rate was transmitted into the other money market rates. A side effect was that every expansion or reduction in the money mar-

ket was passed on the Treasury such that she had to use her 'special credit line' with the Central Bank of Belgium. One of the conditions to come to the second step of the European Economic and Monetary Union is the absence of monetary financing of government debt. To suit this, one had to rearrange the role of the treasury bill such that the treasury bill rate looses a lot of its importance as a monetary policy instrument. The government uses the treasury bill more as an instrument to finance part of its debt. This gives government opportunities to reduce the bargaining power of the financial sector.

Auctions are held periodically to introduce competition. To attract new investors, a secondary market was set up which has to reflect correct market prices. In view of this, fourteen 'primary dealers' were selected in order to create an efficient secondary market. Those 'primary dealers' can generate fee business in order to compensate for the loss they bear in the primary market. By this way the banks cooperative behavior was broken.

By the introduction of an auction procedure open to other market participants, banks and government are not acting in a bargaining game 19 anymore. One can expect the treasury bill rate to become lower than the interbank rate. Evidence for the first months after the reform is given in Table 5.

We notice that the gap between the interbank rate and the secondary market treasury bill rate has disappeared. The treasury bill rate is only slightly below the interbank rate unlike other OECD countries.

TABLE 5

The treasury bill rate and the interbank rate after january 29th 1991 (rate on three months)

	$r_{t\,b}$[17]	ib
feb 91	9.59	9.58
mar 91	9.34	9.33
apr 91	9.26	9.24
may 91	9.04	9.05
jun 91	9.13	9.15
jul 91	9.18	9.20
aug 91	9.30	9.33
sep 91	9.21	9.25
oct 91	9.28	9.32
nov 91	9.44	9.48

Source: Tijdschrift van de NBB, November 1991

The reservation of the market for Belgian and Luxembourg financial institutions during many years has probably created some barriers. It might take some time to convince other market participants to submit bids to buy treasury bills.

V. CONCLUSION

Until january 29th 1991, the Belgian treasury bill rate exceeded the interbank rate. This phenomenon was not observed in other OECD countries although some of them have a comparable debt/GNP ratio. Up to now, no satisfactory explanation was given for this observation.

In this paper, we argue that banks had bargaining power with respect to the treasury bill rate determination. This bargaining power existed since the market for treasury bills was reserved solely for Belgian and Luxemburg financial institutions. This reservation brought banks and government in a bargaining situation. This feature is modelled by setting up a generalised asymmetric Nash bargaining model. Banks and government divide the difference between their threat points The threat points are the Euro-Belgian franc bid rate minus the difference in default premia for the banks, and, the Euro-Belgian franc offered rate plus a lending margin for the government.

Empirical results show that banks aproximately go halves with government. The bargaining power of the banks is reflected in the interest rate paid by the government. Banks' bargaining power consists of two components. Firstly, banks extract the entire difference in default premia between the bargaining parties. Secondly, in addition, the government pays a higher interest rate than the interbank rate.

Since january 29th 1991, an auction procedure is used to determine the treasury bill rate. Non-financial institutions and non-residents may also bid. The switch in interest rate determination is justified in the light of the European Economic and Monetary Union. More specific, monetary financing of government debt will be constrained. The introduction of the auction procedure had positive results. The first evidence shows that the treasury bill rate became slightly lower than the interbank rate. Convincing other investors to make substantial bids could induce a larger gap between the treasury bill and interbank rate.

APPENDIX

Data references

CESMOM Database Leuven
- Euro-Belgian franc mean rate on three-months quoted on the basis of a 365-day year.
- Euro-Deutsche Mark mean rate on three-months quoted on the basis of a 360-day year.
- Treasury bill rate on three-months quoted on the basis of a 360-day year.

Financieel Ekonomische Tijd
- spot exchange rate BF/DM
- forward premium BF/DM-three months

Central Bank of Ireland Quarterly Bulletin
- forward premium
- Exchequer bill rate on three-months quoted on the basis of a 365-day year
- Dublin interbank mean rate on three-months Irish pound quoted on the basis of a 365-day year

Financial Market Trends
- spread on international bank loans OECD-area

NOTES

1. The mean of the bid and offer rate. The bid interest rate is the rate at which the bank will accept deposits from other banks and the asked or offer interest rate is the rate at which the bank will lend to other banks. The difference between the bid and asked rate is called the bid/asked or bid/offer spread.
2. The spot exchange rate as well as the forward premia or discounts are based on mid-rates.
3. To measure true deviations from covered interest parity, it is important to have data on the exchange and interest rate recorded at the same instant in time at which a trader could have dealt (Taylor (1987)). Here we use end-of-month data but are not sure these data were gathered at the same instant in time. However, for the present purposes, we need not be worried too much since those interest parity estimations are not the main concern of our paper.
4. We took 1985 :5 as starting date since the treasury bill rate was introduced as instrument of monetary policy begin may 1985. Since may 1985, the official discount rates have been fixed weekly in relation to (in practice higher than) the rate on three-months treasury bills. This serves to discourage the use of central bank credit by banks to finance the acquisition of short-term government securities (Kneeshaw and Van den Bergh (1989)).
5. Strictly speaking, in a regression without constant term, the Durbin-Watson bounds should be adapted. Here, the bounds test is performed with the usual D.W.-bounds.
6. The R computed by the TSP package is not valid since the mean of the disturbance term in a regression without constant term is not equal to zero. The concept proposed by Barten (1987) is preferred. For a tough analysis of this topic, see Barten (1987).
7. No single financial institution is able to serve the entire trea- sury bill market since the required amount is too large. Hence we assume the financial institutions to cooperate with respect to their objectives such that the Nash bargaining game is applicable.
8. Fama (1986) concluded for the United States that treasury bills produce positive average term premiums while average term premiums for private issuer securities are close to zero. In our framework, no problem with term premiums exists since both treasury bills and Euro-market securities note at par value after three months. Or in the frame of Fama,B /S (Buy a three-months security and selling it at expiry date, this is at zero

months to maturity) has the same return as forward return such that the term premium for both types of securities equals zero.
9. The utility functions denote constant relative risk-aversion (loving).
10. We refer to Osborne and Rubinstein (1991), pp.11-13 for a comprehensive interpretation of those axioms.
11. As Clinton (1988) states, in an active interbank market, posted bid-ask spreads are invariably 0.125 percent. Therefore, we took the mean rate and subtracted 0.0625 percent to get the EBF rate.
12. Data for the spread were gathered in several issues of Financial Market Trends. We took the spread for the OECD-area. To reduce clutter, we need exact data on spreads for short-term credits including management fees. However, more accurate data are not available to our knowledge.
13. We have to be careful in comparing the determination coefficient as measure of empirical performance since the denominator of the R is changed when restrictions are imposed on the estimated parameters.
14. Covered interest rate parity between the three-months EIR and the three-months EBF could not be rejected at a significance level of 5%.
15. Residents for whom the withholding tax is the final tax are not allowed to make offers.
16. For further details see Jaarverslag Nationale Bank van Belgie (1990), p. 105-115.
17. Secondary market returns

REFERENCES

Annaert, J.L., (1990), The Size of the Public Debt and the Financing Conditions of the Treasury: an Empirical Study for Belgium, *Mimeo*, K.U.Leuven.

Barro, R.J., (1974), Are Government Bonds Net Wealth ?, *Journal of Political Economy* 82, 1095-1117.

Barten, A.P., (1987), The Coefficient of Determination for Regressions without Constant Term, in Heijmans,R.D. and Neudecker,H. ed., The Practice of Econometrics,(Martinus Nijhoff Publishers, Dordrecht), 181-189.

Clinton, K., (1988), Transaction Costs and Covered Interest Arbitrage: Theory and Evidence, *Journal of Political Economy* 96, 358-370.

Cook, T.Q., and Lawler, T.A., (1983), The Behavior of the Spread Between Treasury Bill Rates and Private Money Market Rates Since 1978, *Economic Review,* Federal Reserve Bank of Richmond (November/Decem- ber 1983), 3-15.

De Broeck, M., (1990), Valuation of the Issuer-Specific Premium on Government Debt, *Mimeo*, Harvard University.

Fama, E.F., (1986), Term Premiums and Default Premiums in Money Markets, *Journal of Financial Economics* 17, 175-196.

Fratianni, M., and Wakeman, L.M., (1982), The Law of One Price, in the Euro-Currency Market, *Journal of International Money and Finance* 1, 307-323.

Grabbe, J.D., (1986), International Financial Markets, (Elsevier, London).

Kalai, E., (1977), Nonsymmetric Nash Solutions and Replications of 2-Person Bargaining, *International Journal of Game Theory* 6, 129-133.

Kneeshaw, J.T., and Van Den Bergh, P., (1989), Changes in Central Bank Money Market Operating Procedures in the 1980s, *BIS Economic papers* 23.

Lefebvre, O., (1990), Securitisation et intermediation financière de dépots, (Doctoral dissertation, CIACO-Louvain-la-Neuve).

Naudts, B., and Schokkaert, E., (1988), Government Debt and Interest Rates in Belgium 1974-1986, *Tijdschrift voor Economie en Management* 33, 339-354. 22.

Osborne, M.J., and Rubinstein, A., (1990), Bargaining and Markets, (Academic Press, London).

Plosser, C.I. (1982), Government Financing Decisions and Asset Returns, *Journal of Monetary Economics* 9, 325-352.

Pratt, J.W., (1964), Risk Aversion in the Small and in the Large, *Econometrica* 32, 122-136.

Spinnewyn, F., and Svejnar, J., (1990), Monopoly, Unionism and Renegotiation Proof Equilibria, Mimeo, Centrum voor Economische Studiën, K.U.Leuven.
Svejnar, J., (1986), Bargaining Power, Fear of Disagreement and Wage Settlements : Theory and Evidence from U.S. Industry, *Econometrica* 54, 1055-1078.
Taylor, M.P., (1987), Covered Interest-Rate Parity : a High Frequency, High Quality Data Study, *Economica* 54, 429-438.
Van Cayseele, P., (1987), Regulation and International Innovative Activities in the Pharmaceutical Industry, (Doctoral Dissertation, K.U.Leuven).
Veugelers, R., (1989), Wage Premia, Price-Cost Margins and Bargaining Power in Belgian Manufacturing, *European Economic Review* 33, 169-180. 23.